Dynamic Structure Function of a Model Supersolid CHI-DEUK
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sound, which is a fingerprint of superfluid behavior, can be observed in light scatter-
ing through the splitting of the central Rayleigh peak of the thermal diffusion mode
into an additional Brillouin doublet of the second sound [1,2]. Since a supersolid
undergoes a similar transition as a superfluid, we expect that the Rayleigh peak
due to the defect diffusion mode in a normal solid will split into a Brillouin doublet
of propagating modes in the supersolid phase. In this work, we have derived the
hydrodynamic equations of motion including defects, and obtained both the second
sound mode and the dynamic structure function for an isotropic and isothermal
supersolid. We find the splitting occurs not only in the transition from a normal
fluid to a superfluid but also from a normal solid to a supersolid, which might be
observable in light scattering.

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[2] J. A. Tarvin, F. Vidal, and T. J. Greytak, Phys. Rev. B **15**, 4193 (1977).

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